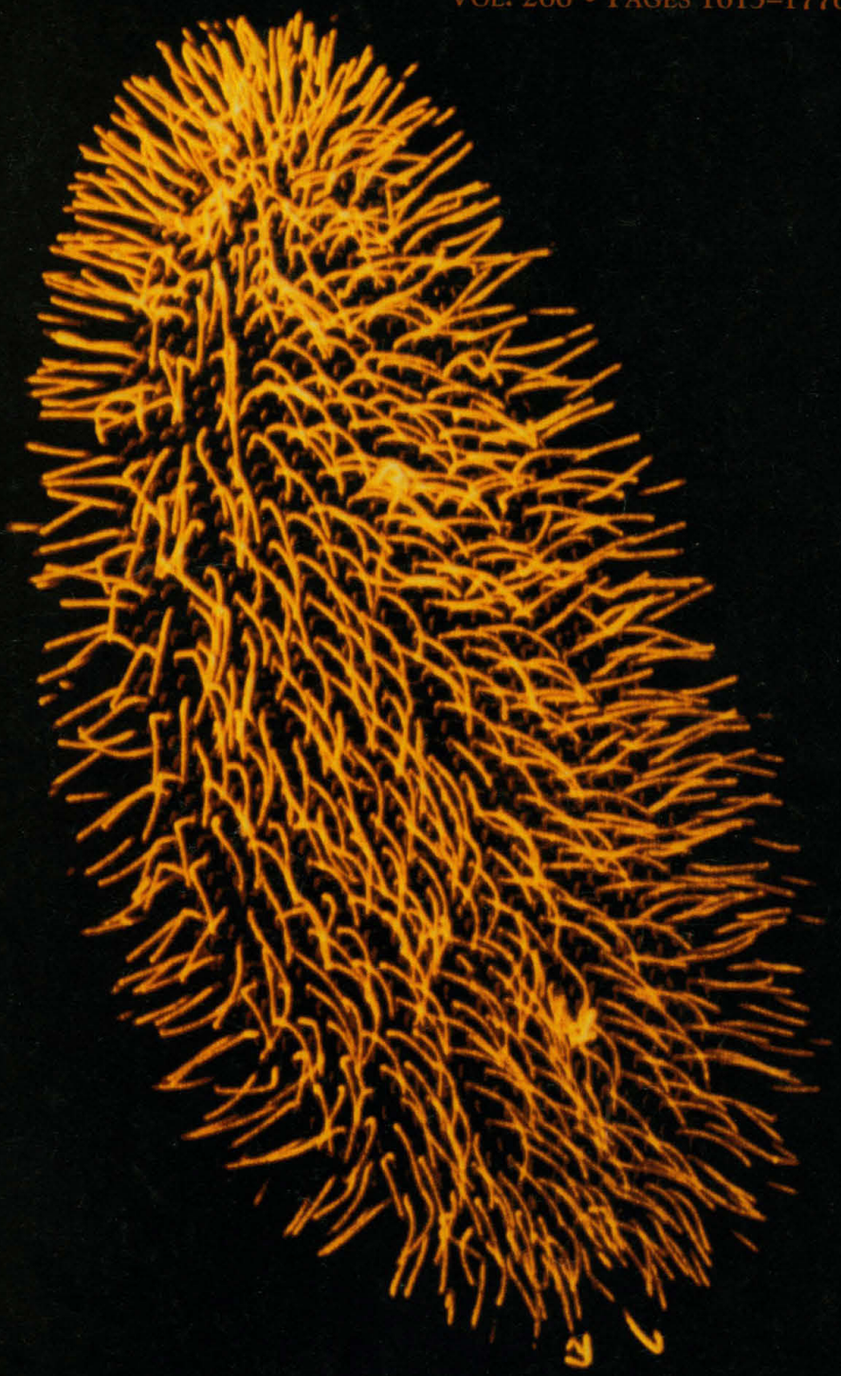
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE

9 DECEMBER 1994 $6.00
VOL. 266 • PAGES 1613–1776



Pfu For High-Fidelity PCR*

Beats Taq

12 to 1

If you need the lowest possible error rate or blunt-ended PCR fragments, you need *Pfu* DNA polymerase! Unlike *Taq* DNA polymerase, *Pfu* proof-reads and corrects errors[1].

The proof is in the PCR. If a 1-kb sequence is amplified for 20 effective cycles, there will be misincorporation mutations in 40% of the products generated with *Taq*, but of those amplified with *Pfu* only 3.2% will have mutations.

The advantages add up to better PCR!

- **>12 times higher fidelity**
- **Blunt-ended fragments**

Our thanks to Dr. Kary Mullis for mutating

Pfu DNA polymerase. There is only one original.

Call Stratagene or your Stratagene distributor for the complete picture.

INTERNET MAIL
tech_services@stratagene.com

USA
Corporate Headquarters
(800) 424-5444
(619) 535-5400
Fax: (619) 535-0045

GERMANY
Stratagene GmbH
Telephone: (06221) 400634
Telefax: (06221) 400639

UNITED KINGDOM
Stratagene Ltd.
Telephone: (0223) 420955
Telefax: (0223) 420234

SWITZERLAND
Stratagene GmbH
Telephone: (01) 3641106
Telefax: (01) 3657707

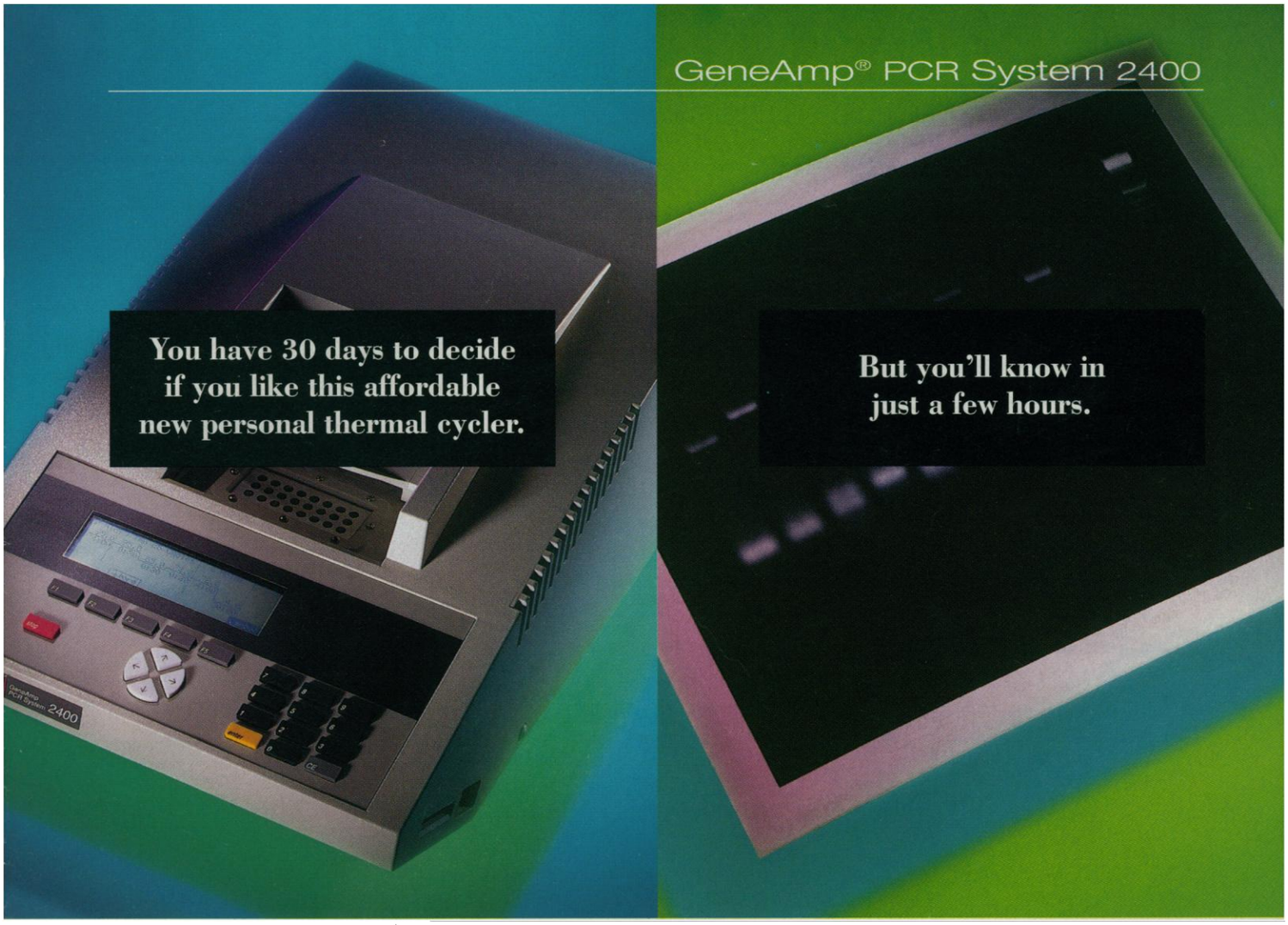
STRATAGENE®

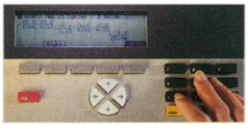
Native *Pfu* DNA Polymerase Catalog #600135 (100U), #600136 (500U)
Recombinant *Pfu* DNA Polymerase Catalog #600153 (100U). #600154 (500U), #600159 (1000U)

*Purchase of this enzyme is accompanied by a license to use it in the polymerase chain reaction (PCR) process in conjunction with an authorized thermal cycler. Stratagene's PCR products are sold under licensing arrangements with Roche Molecular Systems, Inc., F. Hoffmann-La Roche Ltd. and the Perkin-Elmer Corporation.

1. Lundberg, K.S., et al. (1991) Gene 108: 1-6

Circle No. 87 on Readers' Service Card





New graphical user interface: Our new personal thermal cycler brings unmatched convenience and simplicity to PCR protocol programming.

With its advanced design and fast, easy programming, the GeneAmp PCR System 2400 offers all the performance and flexibility you want—at a personal thermal cycler price. Its 24-well sample block provides the accuracy and uniformity for high-speed PCR amplification. And a precision-heated cover eliminates the need for oil, reducing sample handling time dramatically.

Performance is identical to the GeneAmp® PCR System 9600. In fact, you can transport protocols directly from one instrument to the other. MicroAmp™ disposables and GeneAmp® PCR reagents ensure optimal results.

The GeneAmp PCR System 2400 comes with our PCR Performance Guarantee and access to Perkin-Elmer's worldwide technical support. The integrated resources of our Applied Biosystems Division offer the most comprehensive range of systems, technologies, and support in PCR, nucleic acid synthesis, genetic analysis and protein research.

The GeneAmp PCR System 2400 may be exactly the personal thermal cycler you've been waiting for. To help you decide, Perkin-Elmer is offering a no-risk, money-back guarantee. Purchase a system and try it in your lab for 30 days. If you're not completely satisfied, return it for a full refund.

For details, call or fax your local Perkin-Elmer representative.

PERKIN ELMER

U.S. Foster City, U.S. Tel: 800-345-5224 Fax: 415-572-2743
Europe Langen, Germany Tel: 49-6103-708-0 Fax: 49-6103-708-210
Canada Mississauga, Canada Tel: 905-821-8183 Fax: 905-821-8246
Japan Tokyo, Japan Tel: 81-4-7380-8500 Fax: 81-4-7380-8505
Latin America Mexico City, Mexico Tel: 52-5-651-7077 Fax: 52-5-593-6223
Australia Melbourne, Australia Tel: 61-3-212-8585 Fax: 61-3-212-8502

Perkin-Elmer PCR reagents are developed and manufactured by Roche Molecular Systems, Inc., Branchburg, New Jersey, U.S.A.

Roche

ISO 9001

Circle No. 60 on Readers' Service Card

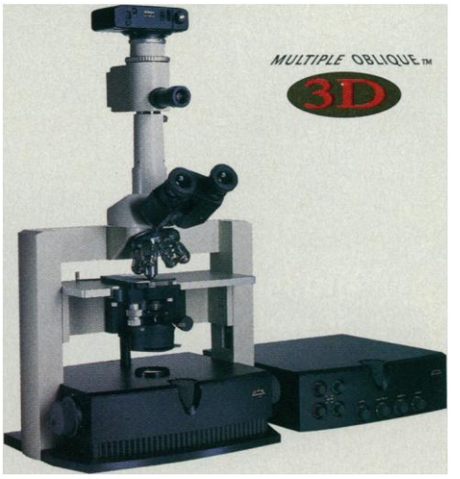
CAN YOUR MICRO

The Edge® R400 microscope, featuring patented Multiple Oblique™ illumination.

The Edge® R400 microscope ushers in a new era for light microscopy. The R400 uses Edge's patented Multiple Oblique™ illumination, consisting of four independently adjustable illuminating beams arranged as left/right pairs. The beams pass through specimens at an oblique angle, generating separate left- and right-eye views. The resulting 3D images can be observed directly through the eyepieces; photographed as stereo pairs or single-picture anaglyphs (color-coded); and acquired via video for computer image processing and quantitative analysis.

Like other high-quality light microscopes, the Edge R400 suits a variety of applications in biological and materials sciences. Unlike others, however, the R400's Multiple Oblique illumination improves resolution, sharpness, contrast, and depth of field, whether the specimen is viewed in three dimensions or in two. This means that, for any given application, the R400 can produce a better image containing more information.

The photomicrographs presented here demonstrate the Edge R400's superior imaging qualities as well as its broad range of applications. If you'd like to see more, call 1-800-597-EDGE (3343) for a brochure filled with 3D images and a free pair of viewing spectacles.

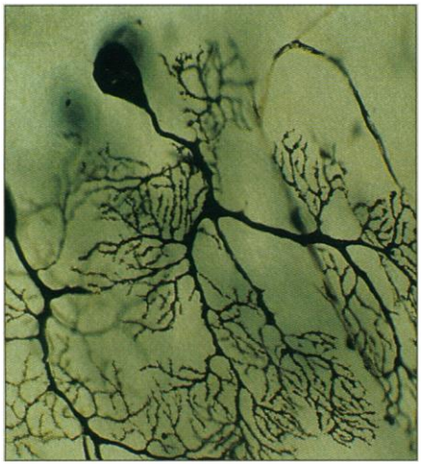


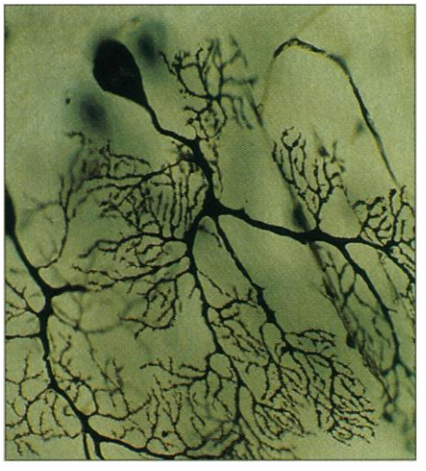
How to view printed 3D pairs using the parallel viewing method:

1. Hold a picture pair close to your eyes and relax your gaze to infinity.
2. Slowly move the page away until a third, central image forms. This is the merged 3D image.
3. Continue moving the page away until the 3D image becomes focused.

An alternative method is to cross your eyes. This reverses the 3D effect front-to-back.

To facilitate parallel viewing, Edge includes an image-merging lunette free with its new brochure. Call 1-800-597-EDGE today!

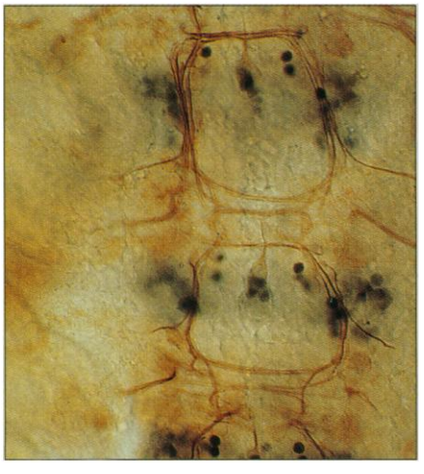


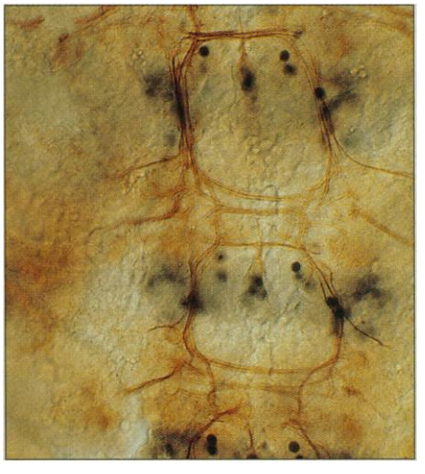


NEUROBIOLOGY

Specimen: Thick section of cerebellum showing purkinje cells. Approx. 50 –75 µm thick.
Objective: Plan Apochromat 40x dry
Qualities: Extraordinary depth of field with large stereo parallax allows tracing path of dendritic spines. High contrast without loss of resolution brings out fine details in spines.

Gary Greenberg, Ph.D.,
Edge Scientific Instrument Corp.





DEVELOPMENT

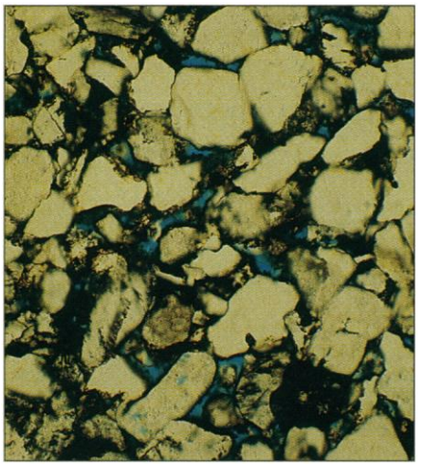
Specimen: Grasshopper embryonic ventral nerve cord, stained for axons (brown) and transcription factor engrailed (black). Approx. 80 µm thick.
Objective: Plan Apochromat 20x
Qualities: 3D perspective distinctly separates out the various dorsal and ventral aspects of the nervous system in the developing grasshopper.

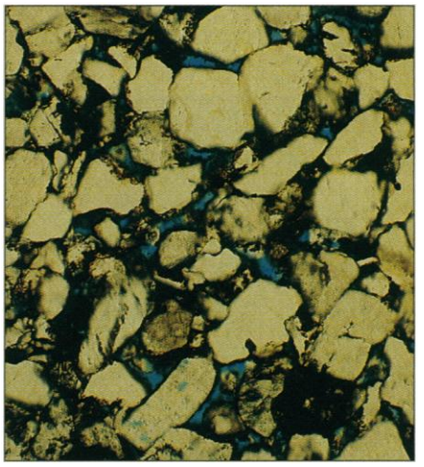
Dr. Barry Condron, Cal Tech

SCOPE DO THIS?

Call* Edge at 1-800-597-EDGE for a brochure and free 3D spectacles

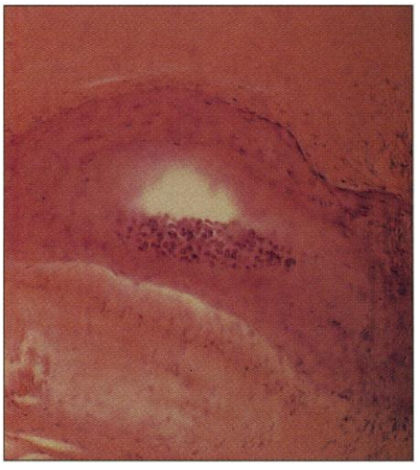
** From outside the U.S. call 310-396-9333.*

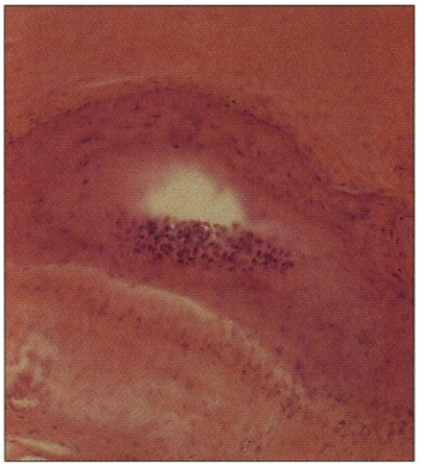




GEOLOGY

Specimen: Thin section of Jurassic Norphlet Sandstone, offshore Gulf of Mexico, showing quartz grains coated with black pyrobitumens.
Objective: Plan Apochromat 20x
Qualities: 3D perspective permits volume evaluation of infiltrated epoxy (blue).

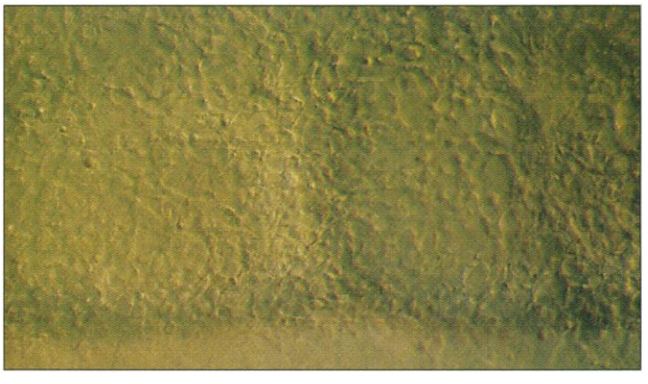




PATHOLOGY

Specimen: Bone from rat recipient of limb transplant, undergoing lethal graft-versus-host disease. Approx. 40 µm thick.
Objective: Plan Apochromat 20x
Qualities: 3D perspective reveals fibrous matrix bone spicule and bone canal with infiltrating mononuclear cells.

Charles W. Hewitt, Ph.D., UMDNJ – Robert Wood Johnson Medical School



WHOLE MOUNTS

Specimen: Close up of two somites of living, unstained chick embryo (HH stage 11).
Objective: LWD 40x dry
Qualities: Even with such a thick sample, superb sharpness and high contrast of individual cells is evident.

Gary Greenberg, Ph.D., Edge Scientific Instrument Corp.

ASK FOR A DEMONSTRATION AND WE'LL SHOW YOU WHAT THIS MICROSCOPE CAN DO.

edge®

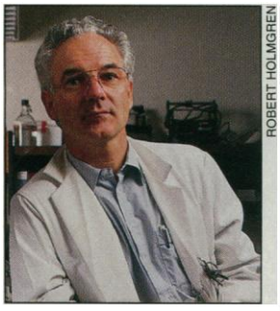
made in the U.S.A.

Circle No. 19 on Readers' Service Card

ISSN 0036-8075
9 DECEMBER 1994
VOLUME 266
NUMBER 5191

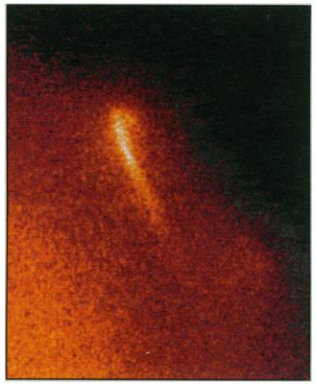
SCIENCE

AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE


ROBERT HOLMGREN

1642
Duesberg and AIDS

1675
Bright lights, big planet



NEWS

SPECIAL NEWS REPORT

POLICY FORUM

PERSPECTIVES

ARTICLE

RESEARCH ARTICLE

REPORTS

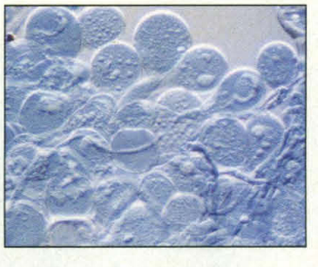
DEPARTMENTS

COVER

Paramecium cilia stained with an antibody that recognizes tubulin posttranslationally modified by the addition of multiple glycine units. Tubulin is the most abundant component of microtubules, which participate in many processes including cell division and cell motility. The polyglycine modification was found on flagellar and ciliary forms of tubulin. (*Paramecium* is ~100 micrometers long.) See page 1688. [Photo: A. Fleury, Laboratoire de Biologie Cellulaire, and M. Laurent, Service d'Imagerie Cellulaire, Orsay, France]

TECHNICAL COMMENTS

1691 & 1695
Evolution of ant-fungal symbiosis



◩ **Indicates accompanying feature**

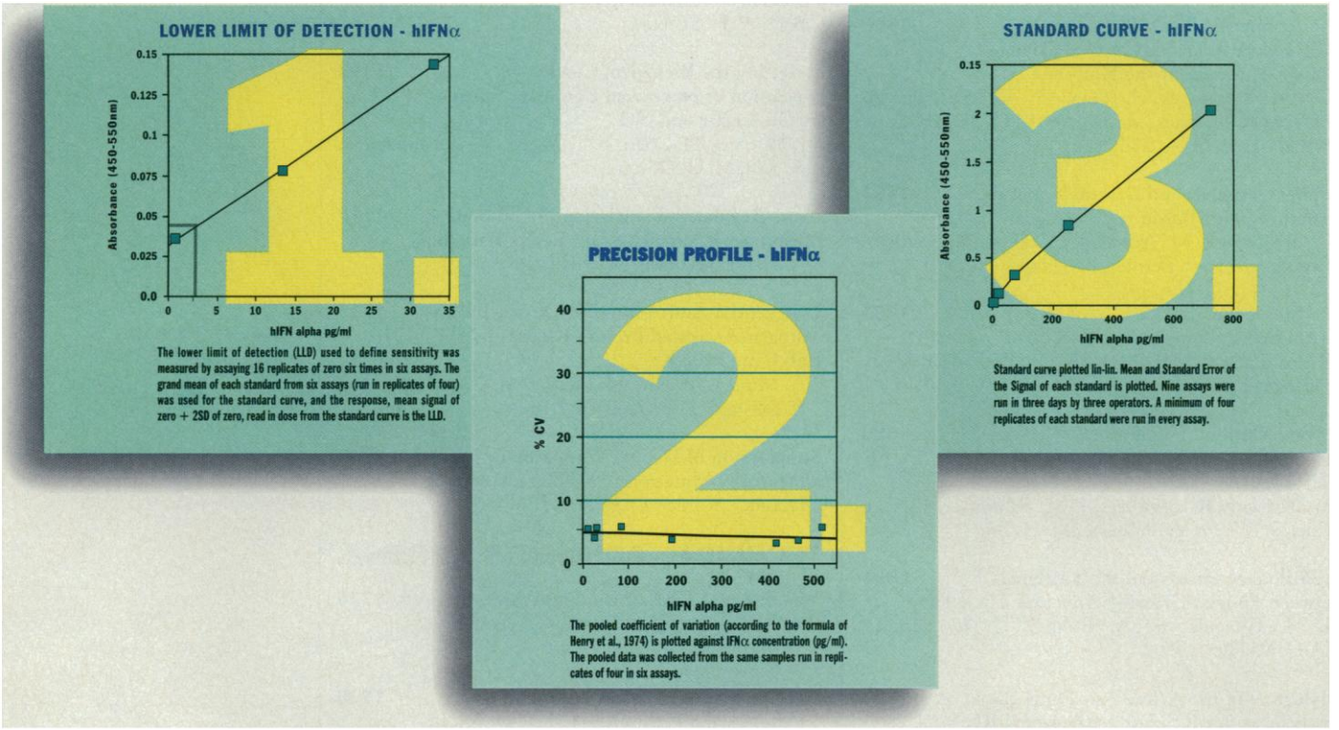
■ **SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005.** Second-class postage (publication No. 484460) paid at Washington, DC, and additional mailing offices.

Domestic individual membership and subscription (51 issues): $92 ($50 allocated to subscription). Domestic institutional subscription (51 issues): $215. Foreign postage extra: Mexico, Caribbean (surface mail) $50; other countries (air assist delivery) $95. First class, airmail, student and emeritus rates on request. Canadian rates with GST available upon request, GST #1254 88122. **Printed in the U.S.A.**

Change of address: allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 2033, Marion, OH 43305-2033. **Single copy sales:** $6.00 per issue prepaid includes surface postage; Guide to Biotechnology Products and Instruments, $20. Bulk rates on request.

Science is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

Human IFNα ELISA.
Validate your results 1, 2, 3.



For cytokine results you can count on.

New. Endogen's human Interferon alpha ELISA has been developed to meet the rigorous and unique requirements for quantitation of this cytokine.

1. **Sensitivity: < 2.5 pg/ml**
2. **C.V.s: < 10**
3. **Assay Range: 2.5 - 700 pg/ml**
4. **Calibrated to NIAID standards**
5. **Protocol: Rapid, User-friendly, 3 hours**
6. **Validated by FS-7 bioassay**

Sensitive. High sensitivity, low background, excellent precision and the capability to detect various subtypes of IFNα are features you can count on.

Tested. This kit has been thoroughly tested in a variety of matrices including serum, plasma, urine and culture supernatants.

NIAID compliant. Endogen's IFNα is calibrated to National Institute of Allergy and Infectious Disease reference standard #Ga23-901-532.

Accurate. For accuracy in cytokine quantitation, validate your results with Endogen.

Call us today at 800-487-4885.

OTHER CYTOKINE ELISAs

HUMAN	MOUSE
•hIL-1α new	•mIL-2
•hIL-1β new	•mIL-3
•hIL-2	•mIL-4
•hIL-4	•mIL-5
•hIL-6	•mIL-6
•hIL-8*	•mIL-10
•hIL-10	•mIFNγ
•hIFNγ	•mGM-CSF
•hGM-CSF	•mTNFα
•hTNFα	
•hTNFβ*	

CELL ADHESION ELISAs

•hsICAM-1*	•hsTNFR*
•hsELAM-1*	•msICAM-1

* Distributed in the U.S. for Bender + Co. GmbH

640 MEMORIAL DRIVE, CAMBRIDGE, MA 02139 USA 617.225.0055 FAX 617.225.2040

ENDOGEN

800·487·4885

Head Office for Europe Biozol Diagnostica
TEL 49+(89) 3192053
FAX 49+(89) 3193611

In Japan Funakoshi Co., Ltd.
TEL 81+(3) 56841622
FAX 81+(3) 56841633

edited by DAVID LINDLEY

Noblesse oblige

A good deal of recent attention has attached to a few dramatic cases of unethical scientific behavior and indeed outright fraud, but in their Policy Forum (p. 1660), Alberts and Shine focus on subtler but perhaps more widespread erosions of scientific integrity. They emphasize that scientists themselves have the primary responsibility to promote, foster, and particularly teach ethical behavior.

The O in core

The Earth's core is mainly iron, but the inferred core density seems to require the presence of a lighter element, such as oxygen. Understanding the core requires knowledge of crystal structures and properties of iron compounds at high pressures. Fei and Mao (p. 1678; see Perspective by Bassett, p. 1662) used a diamond cell apparatus and synchrotron x-ray diffraction measurements to investigate the structure of FeO under core conditions. FeO transforms to the NiAs structure at high pressures, and thus behaves more like a metal. This transition would increase the solubility of oxygen in iron, permitting a less dense core.

Going into graphite

The electronic properties of a solid can be modified by doping it with different elements. In graphite, carbon can be replaced by hexagonal boron nitride, which has a similar structure but a much larger band gap. Stephan *et al.* (p. 1683) produced graphite and carbon nanotubes doped with boron and nitrogen, using a modified electric-arc nanotube synthesis. The rapid synthesis of this material in the plasma discharge may kinetically stabilize its formation, as carbon-boron-nitrogen phases are normally unstable when heated slowly to high temperatures.

The northern lights of Jupiter

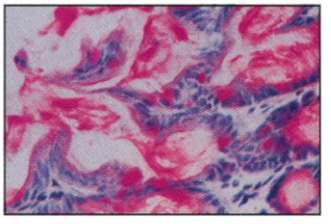
Both Jupiter and Earth exhibit aurorae in their upper atmospheres, but because the magnetospheric dynamics of the two planets are different, it has been questionable whether their aurorae share related mechanisms. Solar wind effects on the Earth's magnetosphere make terrestrial aurorae exclusively nighttime phenomena, but on Jupiter the solar influence is much less, and aurorae occur equally at day or night. Using the Hubble Space Telescope, Gérard *et al.* (p. 1675) made ultraviolet observations of an unusually bright Jovian aurora, tracking it for more than 20 hours. Their results suggest that the aurora was due to electron precipitation along magnetic field lines, as on Earth.

Living together

Attine (leaf cutting) ants live symbiotically with certain fungi: The fungi are essential to the ants' diet, and the ants provide the fungi with a substrate on which to grow. Hinkle *et al.* (p. 1695) and Chapela *et al.* (p. 1691) have examined the evolutionary relationship between ants and fungi by analyzing the fungal ribosomal gene sequences. Both groups find that the most highly evolved attine ants have a long history of coevolution with the fungi. Chapela *et al.* provide evidence that some of the more primitive ants may have repeatedly collected fungal symbionts.

A better mouse

Mice carrying inactivated alleles of the cystic fibrosis (CF) transmembrane conductance regulator (*CFTR*) gene have had limited utility as a model for CF because they die from intestinal obstructions shortly after birth. Zhou *et al.* (p. 1705) corrected this lethal defect and prolonged survival of the mice by expressing a human *CFTR* transgene in the intestines of the mice. In



addition to providing a more viable animal model for CF, these results underscore the potential value of gene therapy for treating patients with CF.

Resetting the clock

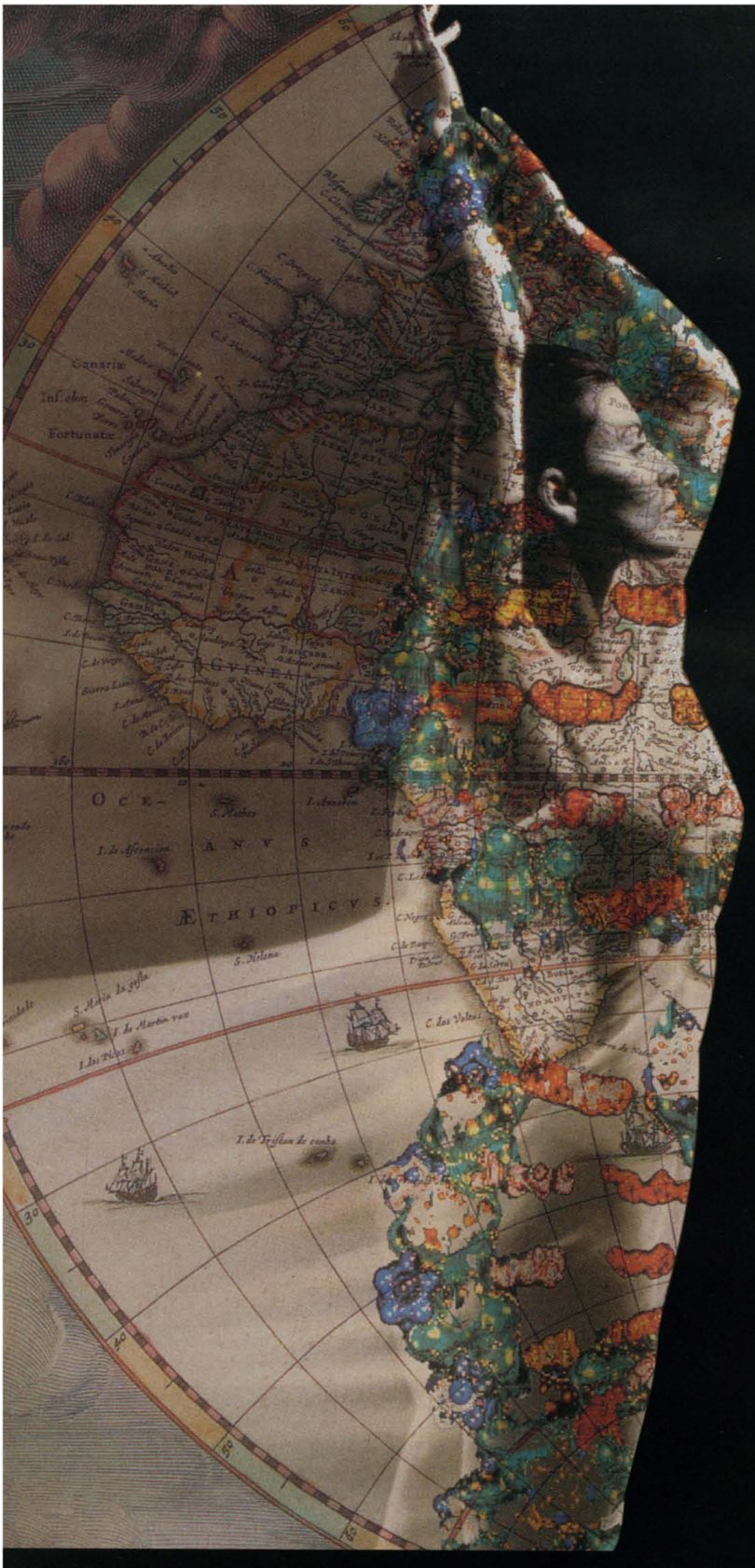
Light resets the circadian clock, located in mammals in the suprachiasmatic nucleus (SCN), presumably by release of excitatory amino acids from neurons connected to the retina. Ding *et al.* (p. 1713) show that treatments of rat SCN with glutamate (Glu), *N*-methyl-D-aspartate (NMDA), or compounds that generate nitric oxide (NO) produced phase shifts in the circadian cycle similar to those induced by light. Antagonists of the NMDA and NO synthase pathways blocked the effects of Glu. Activation of NMDA receptors by Glu is the likely primary signaling event, followed by activation of NO biosynthesis.

Activation by reduction

One of the responses of plant and algal chloroplasts to illumination is increased synthesis of certain photosynthesis-related proteins. The increase is regulated at the level of translation of the mRNAs; the mRNAs available for translation are found complexed with RNA-binding proteins. Danon and Mayfield (p. 1717) found that formation of the complex in the alga *Chlamydomonas* is sensitive to redox potential. Reduction of a regulatory site on the RNA-binding protein activates its ability to bind *psbA* mRNA, while oxidation inhibits it. This type of interaction may provide a mechanism by which the reducing power generated by photosynthesis can regulate the amount of photosystem protein.

Parallel pathways

Binding of growth factors to their receptors initiates a complex series of biochemical reactions that leads to activation of transcription factors. Growth factor–dependent activation of the guanine nucleotide binding protein Ras leads to activation of cascades of protein kinases that sequentially activate one another. Minden *et al.* (p. 1719) show that activation of Ras turns on two such pathways. In one, the protein kinases Raf-1 and MEK and the mitogen-activated protein (MAP) kinases called ERKs are sequentially activated; in the other, a kinase called MEKK leads to activation of a different MAP kinase known as JNK. JNK and the ERKs participate in activation of different transcription factors. Thus, activation of these pathways may account for some of the complex transcriptional regulation that is caused by various growth factors.



MAPPING THE HUMAN GENOME

Advanced by a diverse range of 8-Base Cutters from New England Biolabs

At New England Biolabs, we are dedicated to producing highly-pure restriction enzymes for the manipulation and analysis of genomic DNA. Our diverse range of 8-base cutters includes recombinant Not I, Asc I and Sfi I. And now, NEB introduces recombinant Fse I which offers both the exceptional purity and unmatched value essential for success in your genomic research.

Fse I	#588S	100 units	**Pac I**	#547S	100 units
NEW!	#588L	500 units		#547L	500 units
	5'...G G C C G G▼C C...3'			5'...T T A A T▼T A A...3'	
	3'...C C▲G G C C G G...5'			3'...A A T▲T A A T T...5'	
Asc I	#558S	500 units	**Pme I**	#560S	100 units
MORE UNITS!	#558L	2,500 units		#560L	500 units
	5'...G G▼C G C G C C...3'			5'...G T T T▼A A A C...3'	
	3'...C C G C G C▲G G...5'			3'...C A A A▲T T T G...5'	
Not I	#189S	500 units	**Sfi I**	#123S	2,000 units
	#189L	2,500 units		#123L	10,000 units
	5'...G C▼G G C C G C...3'			5'...G G C C N N N N▼N G G C C...3'	
	3'...C G C C G G▲C G...5'			3'...C C G G N▲N N N N C C G G...5'	

For more information about 8-Base Cutters from New England Biolabs contact us at 1-800-NEB-LABS or via the Internet at info@neb.com.

- **New England Biolabs Inc.** 32 Tozer Road, Beverly, MA 01915 USA 1-800-NEB-LABS Tel. (508) 927-5054 Fax (508) 921-1350 email: info@neb.com
- **New England Biolabs Ltd., Canada** Tel. (800) 387-1095 (905) 672-3370 Fax (905) 672-3414 email: info@ca.neb.com
- **New England Biolabs GmbH, Federal Republic of Germany** Tel. (0130) 83 30 31 (06196) 3031 Fax (06196) 83639 email: info@de.neb.com
- **New England Biolabs (UK) Ltd.** Tel. (0800) 31 84 86 (01462) 420616 Fax (01462) 421057 email: info@uk.neb.com

NEW ENGLAND Biolabs®

20 years and beyond...

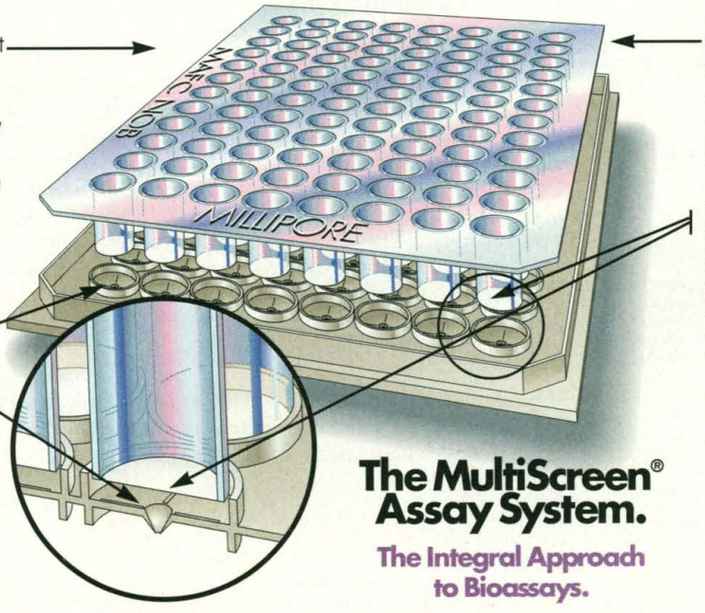
DISTRIBUTORS: Australia (075) 94-0299; Belgium (0800)1 9815; Brazil (011) 66-3565; Denmark (31) 56 20 00; Finland (90) 420-8077; France (1) 34 60 24 24; Greece (01) 5226547; Hong Kong 649-9988; India (542) 311473; Israel (03) 5351205; Italy (02) 38103171; Japan (03) 3272-0671; Korea (02) 556-0311; Mexico (5) 519-3463; Netherlands (033) 95 00 94; New Zealand (09) 418-3039; Norway 22 22 04 11; Singapore 4457927; Sweden (08) 7348300; Switzerland (061) 481 47 13; Taiwan (02) 8802913

Circle No. 67 on Readers' Service Card

Why do an assay in several places when you can do it all right here.

Incubate, filter, precipitate, immobilize, harvest and detect directly in the MultiScreen assay plate. Compared to conventional methods, its 96 discrete filter tubes reduce reagent usage by 50–90%, and radioactive waste by >95%. Compatibility with direct microplate scintillation counters dramatically improves throughput.

MultiScreen handles every assay step. Its patented underdrain assures reliable, multiple incubations. To remove supernatant, just apply vacuum to wash or quantitatively collect filtrate. Easily transfer filters directly into vials for radiodetection.



Whether you're doing receptor binding, second messenger studies, cell culture and proliferation or immunoassays, MultiScreen has been proven faster, simpler, and more efficient.

Let Millipore's Technical Service help you choose the optimum membrane or filter for your assay—glass fiber, cellulosic or charged membranes, Immobilon™ series, low-binding Durapore® and more.

The MultiScreen® Assay System.

The Integral Approach to Bioassays.

MILLIPORE

Call or fax for a complete technical package or to arrange a demo. •U.S. and Canada: 1-800-645-5476 •Japan: (03) 3474-9111 •European headquarters in Paris, fax: 33.1.30.12.71.83
Internet Lab Catalogue: access URL menu, type: http://www.millipore.com

Circle No. 6 on Readers' Service Card

SIGMA ANNOUNCES 4 NEW WAYS TO HELP YOU GROW.

INTRODUCING OUR SERUM-FREE, SPECIALTY MEDIA.

At Sigma, anticipating your growing needs is our business. And to prove it, we're introducing four new serum-free and serum-reduced medium kits to the industry's most complete product line:

1. Keratinocyte Medium Kit - Product No. KMK 1
2. Fibroblast Medium Kit - Product No. FMK 1
3. Melanocyte Medium Kit - Product No. MMK 1
4. Endothelial Medium Kit - Product No. EMK 1 (contains 2% serum in complete medium).

Our four new specialty media come with all the appropriate supplements to form your complete growth medium. So throw away your "shopping list" of medium supplements. These kits also offer flexibility - you can add, withhold, or substitute growth supplements as necessary. And they're cell type-specific, practical and convenient. So, if you're looking for additional growth opportunities, look to Sigma's four new serum-free medium kits. You can count on us for the best in cell culture.

SIGMA CELL CULTURE™

SIGMA®

Where Science and Service Come Together.

Call collect: 314-771-5750,
800-325-3010,
or contact your local Sigma office.

AUSTRALIA AUSTRIA BELGIUM BRAZIL CZECH REPUBLIC FRANCE GERMANY HUNGARY INDIA ITALY
JAPAN MEXICO NETHERLANDS SOUTH KOREA SPAIN SWITZERLAND UNITED KINGDOM UNITED STATES

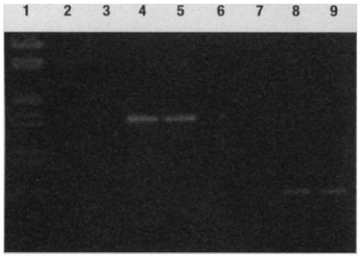
A Sigma-Aldrich Company

Circle No. 16 on Readers' Service Card

Effortless Speed

Impalas bound across the vast African plain–an easy blend of speed and grace–so perfectly have they adapted to their environment.

Now preparing PCR-ready DNA from human whole blood is equally as quick and easy, thanks to Boehringer Mannheim's new Split Second™ DNA Preparation Kit*. No other method requires only 1 microfuge tube, 10 steps, and less than 30 minutes to prepare DNA for direct use in PCR.



Amplification of gene fragments from human genomic DNA isolated with the Split Second DNA Preparation Kit. DNA prepared from 500 µl human whole blood was used for the amplification of two gene fragments. Prepared DNA samples (10 µl each) were amplified with the PCR Nucleotide Mix and Boehringer Mannheim *Taq* DNA polymerase. The resulting PCR products were electrophoresed on a 2% agarose gel. Lane 1: DNA Molecular Weight Marker II; Lanes 2,3,6,7: blank; Lanes 4,5: β-globin (1.5 kb); Lanes 8,9: Duchenne Muscular Dystrophy (547 bp).

Split Second eliminates the tedium of organic solvent extractions and ethanol precipitations. The kit easily adapts to generate template DNA from human blood samples ranging in size from 1 µl to 500 µl. With Split Second, you can successfully prepare PCR-ready DNA from blood stored for up to 1 month at room temperature, +4°C, or -20°C. For even greater efficiency, multiple samples can be prepared simultaneously. The kit can also be used to prepare DNA from leukocytes and buffy coat for direct use in PCR.

Safer by design

Because all preparation takes place in a single tube, Split Second minimizes the risk of exposure to infectious agents. The kit uses no dangerous organics or chaotropic agents, so it reduces the cost of hazardous waste disposal.

Its safer, easier protocol makes Split Second the best choice when preparing DNA from human whole blood for PCR. Contact your Boehringer Mannheim representative, or call us at 1-800-428-5433 (514-686-7141 in Canada) .

Split Second™ is a trademark of Boehringer Mannheim Corporation.

*U.S. Patent pending.

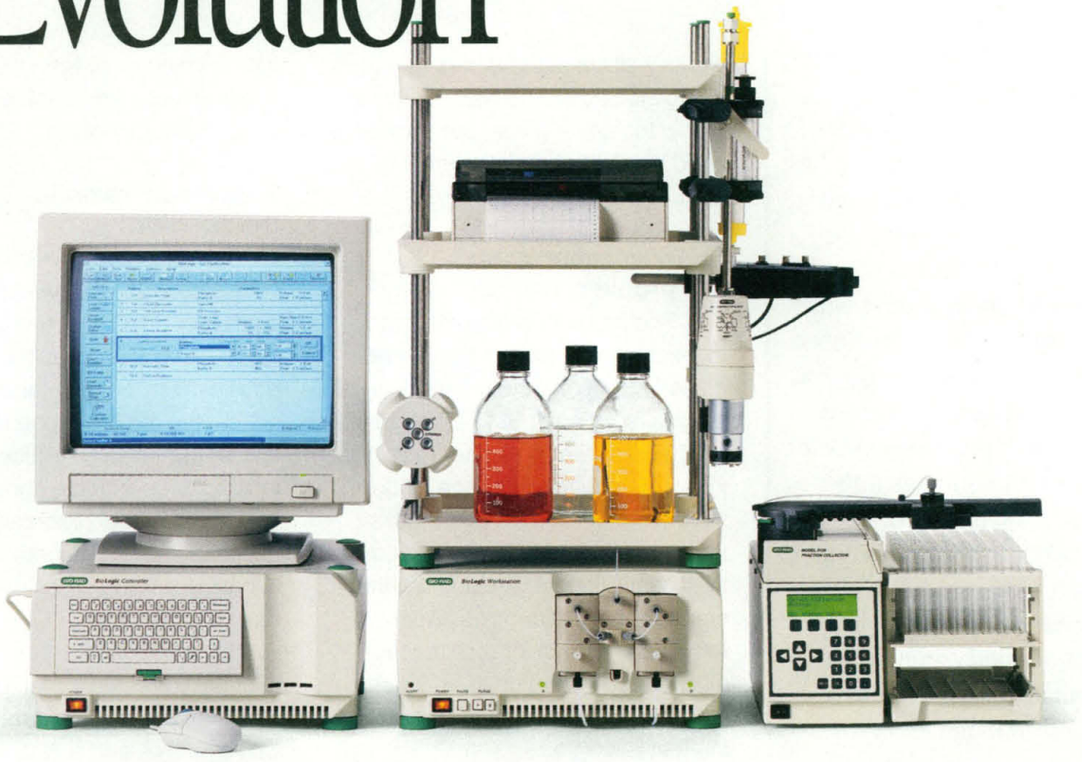
These products are sold under licensing arrangements with Roche Molecular Systems and The Perkin-Elmer Corporation. Purchase of these products is accompanied by a license to use them in the Polymerase Chain Reaction (PCR) process in conjunction with an Authorized Thermal Cycler.

mannheim boehringer *Biochemicals*

BOEHRINGER MANNHEIM Corporation
9115 Hague Road
P.O. Box 50414
Indianapolis, IN 46250-0414
USA

Circle No. 83 on Readers' Service Card

The Logical rEvolution



Finally, a logical approach to biomolecule purification.
Presenting the BioLogic System.

Easy to use. Versatile. Affordable. The new BioLogic System is a logical evolution in biomolecule purification. Our ***user-friendly,*** Windows® based software features pull-down menus and intuitive icons for simpler methods programming and system operation. And simple, concise dialogs allow you to work like you think: logically. Now you can concentrate on the separation, not the equipment. An extended, 1,000 psi pressure limit permits a ***wider choice of chemistries,*** including ion exchange, affinity, HIC, hydroxyapatite, size exclusion, and reversed phase. Best of all, the BioLogic System is very ***affordable.*** Call 1-800-4-BIORAD for information about the BioLogic System, the logical choice for biomolecule purification.

BIO-RAD **Bio-Rad Laboratories**

Life Science Group

(US) (800) 4BIORAD • (AU) 02-805-5000 • (AT) (1)-877 89 01 • (BE) 09-385 55 11 • (CA) (905) 712-2771 • (CN) (01) 2051873 • (FR) (1) 49 60 68 34 • (DE) 089 31884-0 • (IT) 02-21609 1 • (JP) 03-3534-7665 • (HK) 7893300 • (NL) 08385-40666 • (NZ) 09-443 3099 • (SG) (65) 443 2529 • (ES) (91) 661 70 85 • (SE) 46 (0) 8-735 83 00 • (CH) 01-810 16 77 • (GB) 0800 181134

Windows is a trademark of MicroSoft Corp. SIG 071494

Circle No. 38 on Readers' Service Card

New Technique Revolutionizes Microscopic Study of Living Cells

Some of the most significant biological research being done today involves the study of cellular dynamics inside living tissue. Using the Nikon RCM-8000 realtime confocal microscope and a special water immersion objective developed by Nikon, scientists are observing phenomena never before seen by the human eye. These include changes in calcium concentration during cell contractions, protein sub-unit transport mechanisms in living cells, neuronal cell-to-cell interactions and communications, and early developmental structures in living embryos.

Scientists have found that many of the optical microscopy techniques currently available are not well suited for the study of cellular dynamics inside living tissue.

Working with thinly cut sections of fixed tissue placed up against the cover glass, researchers are able to produce superb images using techniques such as confocal microscopy, DIC and epi-fluorescence. The problem arises when they try to study living cells *in vivo* or *in vitro* surrounded by physiological solution.

In the past, researchers have tried to achieve higher resolution by using plan apochromat or fluor high numerical aperture (NA) oil immersion objectives. This technique works well when the details or events being studied are no more than 15µm below the cover glass, but cannot be used when the area of interest is 100µm to 200µm deep.

Spherical aberration is a problem

The problem is the different indexes of refraction of the oil and glass (1.515) and the aqueous physiological solution (1.33). The light rays are bent toward the higher refractive index at the glass interface, causing severe spherical aberration. This is seen as a loss of intensity and contrast, inability to collect and resolve small spatial frequencies and reduced accuracy of reproduction — all in direct proportion to how deep beneath the cover glass the area of interest lies.

Spherical aberration is especially troublesome in confocal imaging, a technique which is normally used to achieve increased resolution and narrow depth of field while eliminating out-of-focus light. In confocal systems, the illuminating pinhole is imaged on the specimen and a moving mirror mechanism scans the specimen in a raster pattern. The light emitted from the specimen is rescanned by the same mechanism and reimaged through the pinhole. Since only the light that passes back through the pinhole is imaged, all out-of-focus light is eliminated.

When scanning deep within a specimen using an oil immersion objective, spherical aberration can become so extreme that much of the light coming back from the specimen is out of focus and unable to return through the pinhole.

Water immersion is the solution

This problem can be solved through the use of a water immersion objective. The refractive index of water closely matches that of both physiological solution and living cells, so that the effect of spherical aberration is dramatically reduced when looking deep within a specimen. Water also offers practical advantages because it will not fluoresce or contaminate physiological solution, and is easy to clean up.

Nikon has successfully produced a highly corrected water immersion 60x CFN plan apochromat objective with a 1.2 NA and a 220µm working distance. It has a correction collar that accommodates for cover glasses from 0.15mm to 0.18mm thick. This unique objective not only virtually eliminates spherical aberration, but is also chromatically corrected with high transmission in the near ultraviolet through the red spectrum, making it useful for confocal, fluorescence and DIC microscopy.

For more information on this exciting new technique, call Nikon at (516) 547-8567, fax us at (516) 547-0306, or contact us on the Internet at nikonbio@aol.com.

Nikon Inc., Instrument Group
Biomedical Instrument Department
1300 Walt Whitman Road
Melville, NY 11747

LVMH MOËT HENNESSY ♦ LOUIS VUITTON SCIENCE PRIZE

science pour l'art

CALL FOR SUBMISSIONS

Each year, the LVMH MOËT HENNESSY ♦ LOUIS VUITTON Group rewards with the Science for Art Prize scientists chosen from all over the world for the impact of their discoveries on artistic creation and aesthetic appreciation. The theme of the 1995 Prize is:

"PLAY OF LIGHT AND MATTER"
Encounters and Conjunctions

While light has been, and still is, the foremost method of exploring the structure and understanding the properties of matter, the ***interaction of light and matter*** *can also* ***create, transform*** *and* ***animate*** *both light and matter.*

It is these diverse aspects of the ***active interaction*** *between light and matter that make the theme of the 1995 LVMH Science for Art Prize. Thus, works in the following scientific fields are particularly relevant:* ***mathematics, physics, chemistry, physicochemistry*** *and* ***biology****, along with all* ***simulation techniques****,* ***analytical tools*** *or* ***processes*** *related to these phenomena.*
Priority will be given to reports that deal with ***both*** *theoretical and experimental/applied aspects.*

The Science Prize, worth 100,000 FF (about US$ 19,000), *will be awarded to the work that opens the widest scope of study to fundamental or applied research, based on its technological and commercial interest.*

PAST WINNERS OF THE PRIZE

1988 Benoit MANDELBROT, Yale University, USA
Karl KNOP, Federal Polytechnic Institute, Switzerland
1989 Pierre-Gilles de GENNES, Collège de France, France
Jerzy DOBROWOLSKI, National Research Council, Canada
Sueo KAWABATA, Kyoto University, Japan
1990 Hans KUHN, Max Planck Institute, Germany
Werner OSTERTAG, BASF, Germany
1991 Semir ZEKI, University College, United Kingdom
Jozsef SZEJTLI, Cyclolab Co., Hungary
1992 Richard AXEL & Linda BUCK, Columbia University & Harvard Medical School, USA
Nicolas FRANCESCHINI, CNRS Marseille, France
1993 Samuel EDWARDS, Cambridge Cavendish Laboratory, United Kingdom
Wolfgang HELFRICH, Free University Berlin, Germany
1994 Michael BERRY, University of Bristol, United Kingdom
Harold KROTO, University of Sussex, United Kingdom

PRIX D'HONNEUR: *in 1992 Jean-Pierre CHANGEUX & Shosaku NUMA, in 1993 Walter GEHRING and HUMAN FRONTIER SCIENCE PROGRAM, in 1994 Michel LACLOTTE.*

The deadline for submitting an application is ***January 27, 1995****.*
Guidelines for application may be obtained from :

LVMH MOËT HENNESSY ♦ LOUIS VUITTON
science pour l'art
Direction du Développement
30 avenue Hoche
75008 PARIS - FRANCE
Fax : +33/(1) 44.13.22.23

LVMH Inc.
science pour l'art
Two Park Avenue, Suite 1830
NEW YORK, NY 10016 - U.S.A.
Tel : (212) 340-7489
Fax: (212) 340-7620

LVMH JAPON K.K.
science pour l'art
Sumitomo Hanzomon Building
3-16 Hayabusa-cho, Chiyoda-ku
TOKYO 102 - JAPAN
Tel : +81/(03) 3263-1031
Fax: +81/(03) 3234-8561

ANNOUNCING JANDEL SIGMAPLOT 2.0 FOR WINDOWS

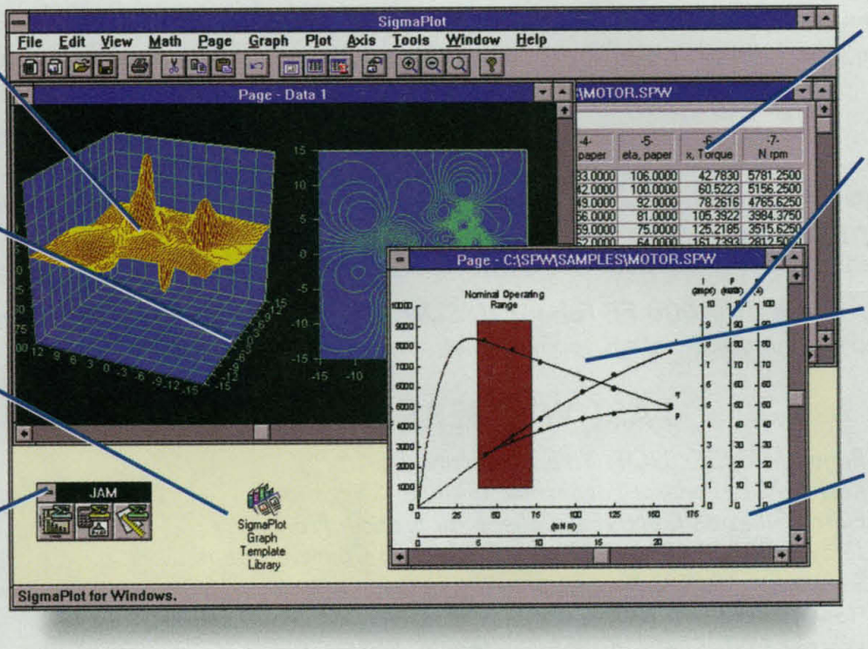
The Proof is in the Plotting

Numerous Scientific Graph Types
Contour, 3D Mesh, 3D Scatter, Grouped Bar Charts, Vector, Histograms, Stacked Bar Charts and many more

Customize Every Detail
Multiple plots on one graph • Multiple graphs on one page • Bitmapped images within graphs

Optional SigmaPlot Graph Library
Instantly open one of over 150 publication and presentation-quality graph templates

SigmaLink™ to Other Jandel Products
With a single mouse click, switch between Jandel SigmaPlot, SigmaStat, and SigmaScan/Image



1,000,000,000 Cell Worksheet
Import Excel®, 1-2-3®, Quattro®, dBASE® and others • Powerful transform language

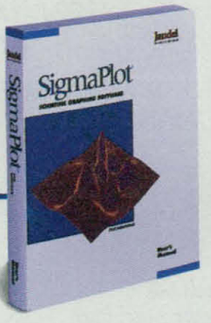
Complete Axis Control
Multiple vertical and horizontal axes • Axis breaks • Linear, semi-log, log, logit, probit, and probability axis scales

Multidimensional Nonlinear Curve Fitting
10 independent variables 25 parameters • Piecewise continuous, multifunctional, weighted, and Boolean functions

True WYSIWYG for Publication Quality Output
What you see really is what you get, so you will get the print output you want on any Windows-supported device

JANDEL SIGMAPLOT®: POWER AND FLEXIBILITY FOR THE MOST PRECISE PLOTS

Award-winning Jandel SigmaPlot 2.0 for Windows™— the best just got better. For over twelve years, scientists have trusted SigmaPlot more than any other technical graphing program to prepare their graphs for publication. Now, new version 2.0 gives you contour plots, multi-line text, custom zooming, automatic legends, and more. You can control every detail of your graph to show data the way you want. We've made our point. Now let us prove it.



FOR MORE INFORMATION, OR TO ORDER JANDEL SIGMAPLOT 2.0 FOR WINDOWS CALL 1-800-4-JANDEL (1-800-452-6335)

OTHER JANDEL PRODUCTS

SigmaPlot DOS No. 72 **Macintosh** No. 73
SigmaPlot Graph Library, Volume One: Graph templates No. 74
SigmaSuite™: Integrated graphics, statistics, image measurement No. 75
SigmaStat®: Intuitive statistical software No. 76
SigmaScan®/Image: Image measurement software No. 77
Mocha®: Automated image analysis software No. 78
TableCurve™ 2D: Automated curve fitting software No. 79
TableCurve™ 3D: Automated surface fitting software No. 80
PeakFit™: Peak analysis software No. 81

FOR MORE INFORMATION PLEASE CALL, FAX, OR E-MAIL:

Jandel Scientific: 2591 Kerner Blvd., San Rafael, CA 94901
415-453-6700 Fax: 415-453-7769

Internet: sales@jandel.com

In Europe: Jandel Scientific, Schimmelbuschstrasse 25, 40699 Erkrath, Germany 02104/36098 02104/33110 (FAX).

International Dealers: Australia 2 958 2688, 3 602 5088, Brazil 11 453 5588, Canada 519 767 1061, Denmark 42 15 05 44, France 05 90 37 55, India 40 84 1208, Israel 349 0823, Japan 3 3590 2311, 3 5689 8000, Kuwait 242 1851, South Africa, 12 663 4500, Switzerland 41 617 12 16 16, Taiwan 2 788 6777, 2 705 1590, UK 0800 89 49 82.

Jandel
SCIENTIFIC SOFTWARE

For more information circle the above reader's service number

Circle No. 82 on Readers' Service Card

AT LAST,

A PCR DETECTION ASSAY

THAT ADAPTS TO ANY TARGET.

Universal detection capability is one reason why Digene's SHARP Signal™ System hits the mark with so many labs. Because the same protocol can detect a variety of targets, it's cost-effective. It uses no radioactive isotopes, so there are no disposal costs to consider. It's so sensitive, it can detect positive PCR specimens that start with as few as 10 input molecules. Assay results are available in just a few hours. And, it won't detect PCR artifacts such as primer dimers – only the target of interest is detected. Best of all, it's a standardized strip-well microplate format that gives both qualitative and quantitative colorimetric results. All considered, Digene's SHARP Signal System is one PCR detection assay that's right on target.

To order your kit or for more information, call 1-800-DIGENE-1. International inquiries, call 301-470-6500 or fax 301-680-0696.

DIGENE
DIAGNOSTICS, INC.

Digene SHARP Signal System Probe/Primer Sets are available to detect HIV, HBV, HCV, CMV, Mtb, and other infectious disease targets.

For research use only. The Polymerase Chain Reaction (PCR) process is covered by U.S. patents owned by Hoffman-LaRoche.

Circle No. 37 on Readers' Service Card

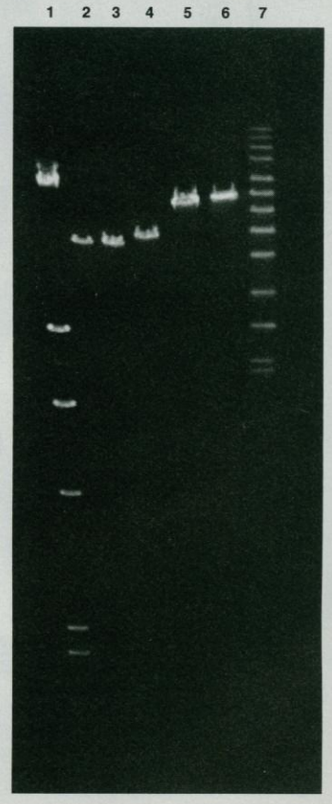
POWER PCR

TaKaRa LA PCR Kit *for The Ultimate Exploration of the Human Genome*

TaKaRa LA PCR Kit (Code No. RR011) is proven for premium performance: Long and Accurate PCR with greater fidelity and higher yields.

Amplification of Genomic DNA Fragments

Human genomic DNA fragments in various lengths were efficiently amplified with this LA PCR Kit.



Lane 1	λDNA/*Hind* III marker	
Lane 2	Mitochondria	16.3 kb
Lane 3	β-globin cluster	16.5 kb
Lane 4	β-globin cluster	17.5 kb
Lane 5	β-globin cluster	21.5 kb
Lane 6	β-globin cluster	22.5 kb
Lane 7	High MW marker	

Available Soon: LA PCR *in vitro* Cloning Kit and LA PCR *in vitro* Mutagenesis Kit

TaKaRa BIOMEDICALS

TAKARA SHUZO CO., LTD.
Biomedical Group
Otsu, Shiga, Japan
Tel: +81 775-43-7247
Fax: +81 775-43-9254

DISTRIBUTORS *for More Information and Orders:*

PanVera Corporation (USA and South America)
Tel: 608-233-5050 Fax: 608-233-3007
Toll Free: 1-(800) 791-1400

ITC Biotechnology GmbH (Germany)
Tel: (06221) 303907 Fax: (06221) 303511

Cheng Chin Trading Co., Ltd. (Taiwan)
Tel: (02) 331-3111 Fax: (02) 382-2197

Protech Technology Enterprise Co., Ltd. (Taiwan)
Tel: (02) 381-0844 Fax: (02) 311-8524

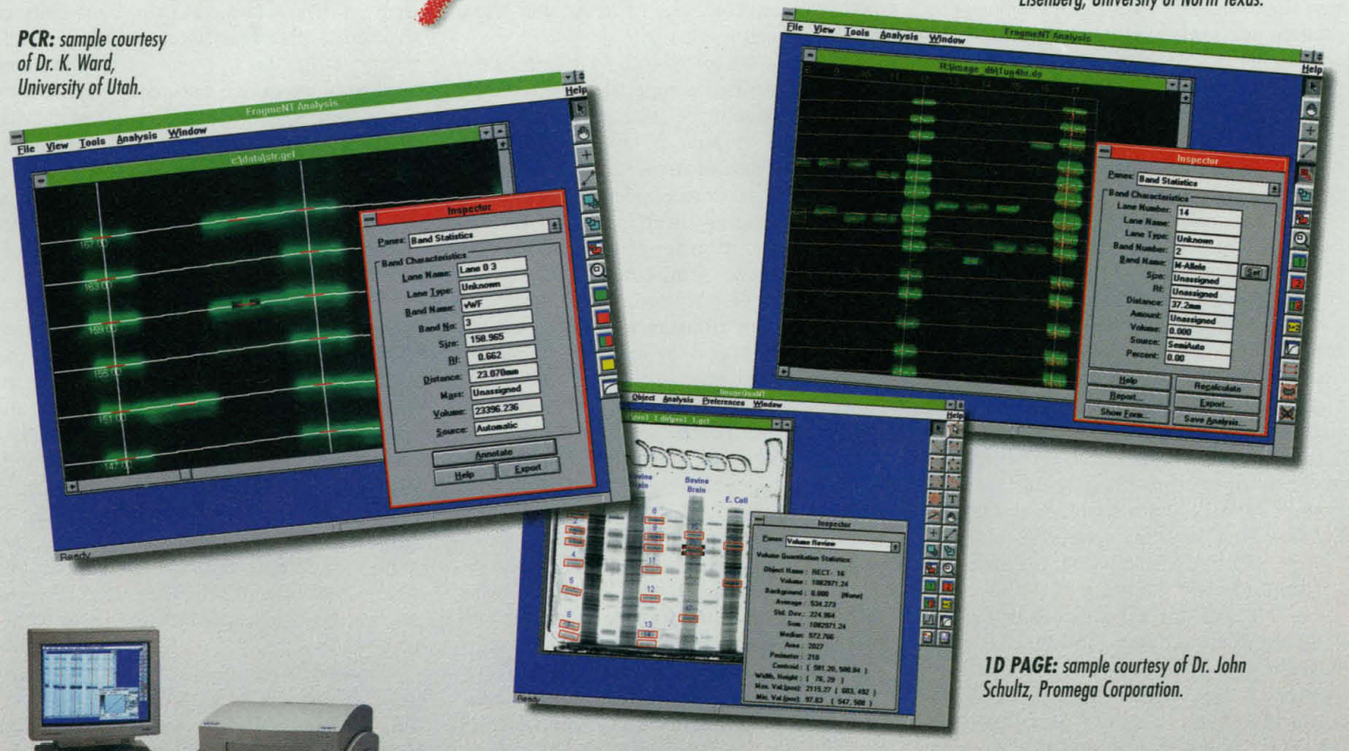
Circle No. 17 on Readers' Service Card

vistra FLUORESCENCE

Fluorescence

Southern RFLP: *sample courtesy of Dr. Arthur Eisenberg, University of North Texas.*

PCR: *sample courtesy of Dr. K. Ward, University of Utah.*



1D PAGE: *sample courtesy of Dr. John Schultz, Promega Corporation.*

FluorImager SI: *Simple, sensitive, non-radioactive, high throughput fluorescent imaging.*

Fluorescence — Instead of Autoradiography

Use the new high-throughput FluorImager™ SI to see and quantitate your gels, blots, TLC and microplates without autoradiography or scintillation. There's no film, no exposures, and no darkroom processing to slow you down. You'll get the sensitivity you need, plus powerful software that turns your data into results – fast.

PCR* Fragment Analysis

You can quantitate single PCR products, do STR analysis, or use the FluorImager system's two-channel detection for competitive priming assays. RAPD and AmpFLP protocols are fully supported.

Southern Blotting

Achieve single-copy sensitivity for your Southern blot applications with fluorescence. Fluorescent probes are stable for months. The FluorImager system makes it easy to produce quantitative, publication-quality images.

PAGE and Western Blotting

Simple-to-use fluorescent dyes let you see just nanograms of protein in your gels. Then you can transfer those same proteins to membranes – without any reduction in transfer mobility – for fluorescent Western blotting.

A Complete Solution

It's easy to convert to fluorescence. DNA and protein applications for the FluorImager SI are supported by optimized reagent kits, protocols and technical services from ™Vistra Fluorescence Systems, an alliance of Amersham Life Science and Molecular Dynamics. Call today for more details on *your* application: **1 800 9 VISTRA** in the U.S.

AN ALLIANCE OF Molecular Dynamics & Amersham LIFE SCIENCE

Molecular Dynamics

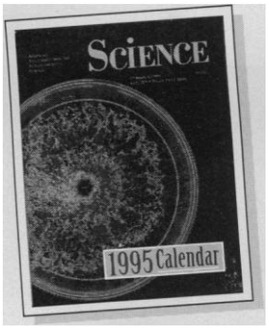
Innovative Instrument Systems for the Life Sciences

928 East Arques Avenue • Sunnyvale, California 94086-4520 USA

Phone: 1-800-333-5703 or 408-773-1222 • Fax: 408-773-1493

In France, call (33) 1 60 86 65 13. In Germany (49) 2151 83870. In the U.K., and other European countries (44) 01494 793377. In Japan (03) 3976 9692. In Australia (03) 810 9572.

The 1995 SCIENCE Calendar



From the first experiments with electricity to the genetic revolution, scientists around the globe have looked to the pages of SCIENCE for leading-edge research and scientific news. Now SCIENCE announces another publishing event: **The SCIENCE 1995 Calendar.** This full-color calendar features:

- 12 full-color mini-poster SCIENCE covers
- Oversized 9"x 12" format
- Large date blocks with major holidays
- An important moment in the history of science highlighted each month

Whether you're planning scientific research or researching the perfect gift for your favorite scientist, you'll want to have your own copy of the **1995 SCIENCE Calendar!**

Science is pleased to announce that the 1995 calendar is now available through Majors Bookstores. To order, just contact one of the stores listed or contact SCIENCE by filling out the coupon below.

Majors Scientific Books
Dallas
2137 Butler Street
Dallas, TX 75235
(214) 631-4478
1-(800) 435-3378
Fax: (214) 630-0410

Majors Scientific Books
Atlanta
141 North Avenue, NE
Atlanta, GA 30308
(404) 873-3229
1-(800) 231-3229
Fax: (404) 888-9427

Majors Scientific Books
Houston
7205 Fannin
Houston, TX 77030
(713) 799-9922
1-(800) 221-9697
Fax: (713) 799-1522

I want to show my support for SCIENCE. Please send me _____ copies of the 1995 SCIENCE Calendar, for $12.50 (AAAS Member price $11.50). I have enclosed a check for the amount of the calendar (plus shipping charges for non-US orders). I understand my order is refundable if I am not completely satisfied.

Shipping Address *(please print)*

Name_____
(last name) *(first name)*

Address_____

City/State/Postal Code_____

Please allow 4–6 weeks for delivery. Prices and shipping charges subject to change without notice. Calendars returned must be in salable condition. *Wash., DC residents please add sales tax.*

Payment Information

☐ **US dollar check** ☐ **VISA** ☐ **Master Card** ☐ **AmEx**

Important: All payments must be made in US dollars. $25 minimum order for all credit card orders. Make check payable to AAAS Science Publications, Inc.

_____
Credit card number *Expiration date*

Signature _____

Send orders to: Attn: Corrine Harris, AAAS Science Publications, Inc.
1333 H St., NW, Washington, DC 20005
(202) 326-6527 • FAX (202) 682-0816

Subtotal . . . . . _____

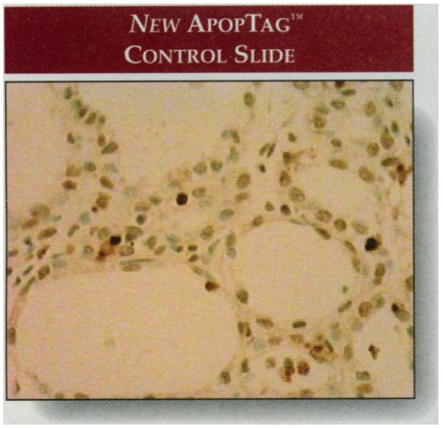
DC Sales Tax . . . . . _____

Outside the US:
Add $3.50 per Calendar air delivery . . . . _____

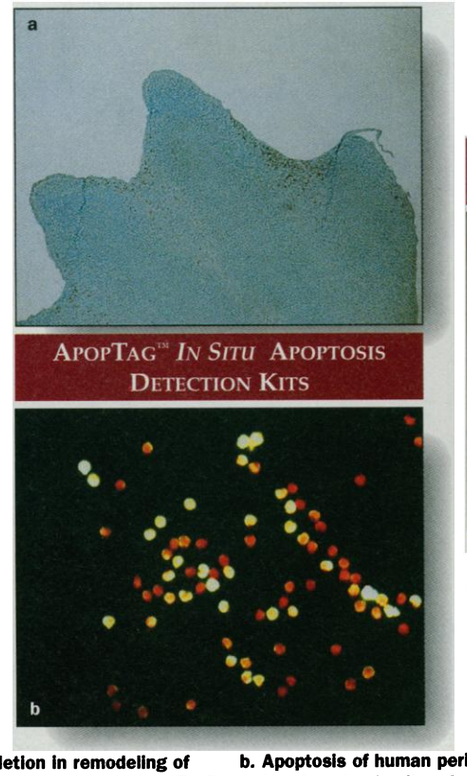
Total Enclosed . . . . . _____

SCIENCE

Access Apoptosis.

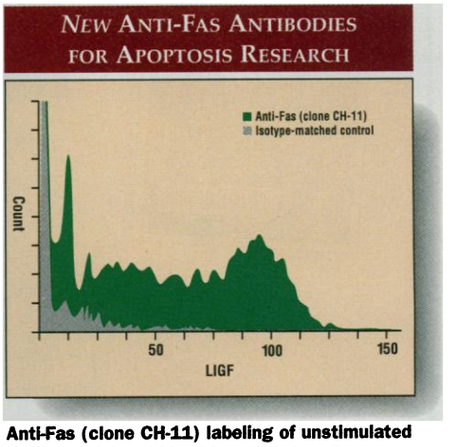


Apoptosis in 4-day post-weaning rat mammary gland (ApopTag™ Control Slide), Apoptag™ Peroxidase Kit and methyl green (X400)



a. Developmental cell deletion in remodeling of mouse forelimb bud (14-day embryo), ApopTag™ Peroxidase Kit and methyl green (X200)[2]

b. Apoptosis of human peripheral blood lymphocytes in vitro, ApopTag™ Fluorescein Kit (yellow) and propidium iodide (red) (X400)[3]



Anti-Fas (clone CH-11) labeling of unstimulated human peripheral blood lymphocytes, flow cytometry[4] vs. an isotype-matched control monoclonal antibody

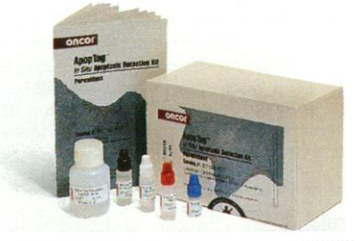
At Oncor, one of our missions is to help life scientists unlock the secrets of programmed cell death. Beginning with our breakthrough ApopTag™ *In Situ* Apoptosis Detection Kit, our line of innovative products for apoptosis research has now grown to include:

ApopTag™ *In Situ* Apoptosis Detection Kit Our popular ApopTag™ Detection Kit, in peroxidase and fluorescein versions, shows apoptotic cells in the context of the surrounding tissue. Able to detect individual apoptotic cells, easy-to-use ApopTag™ provides more information than DNA ladder analysis.

ApopTag™ Control Slides Available in packs of five, these new, positive control slides are valuable for reference and procedural troubleshooting.

Antibodies for Apoptosis Research The cell surface Fas antigen can mediate apoptosis. Our new monoclonal antibodies include Anti-Human Fas CH-11, UB2 and FITC-labeled UB2.

To learn more, call us. And investigate apoptosis with Oncor on your side.



oncor®

209 Perry Parkway
Gaithersburg,
MD 20877

1-800-77-ONCOR
301-963-3500
Fax: 301-926-6129

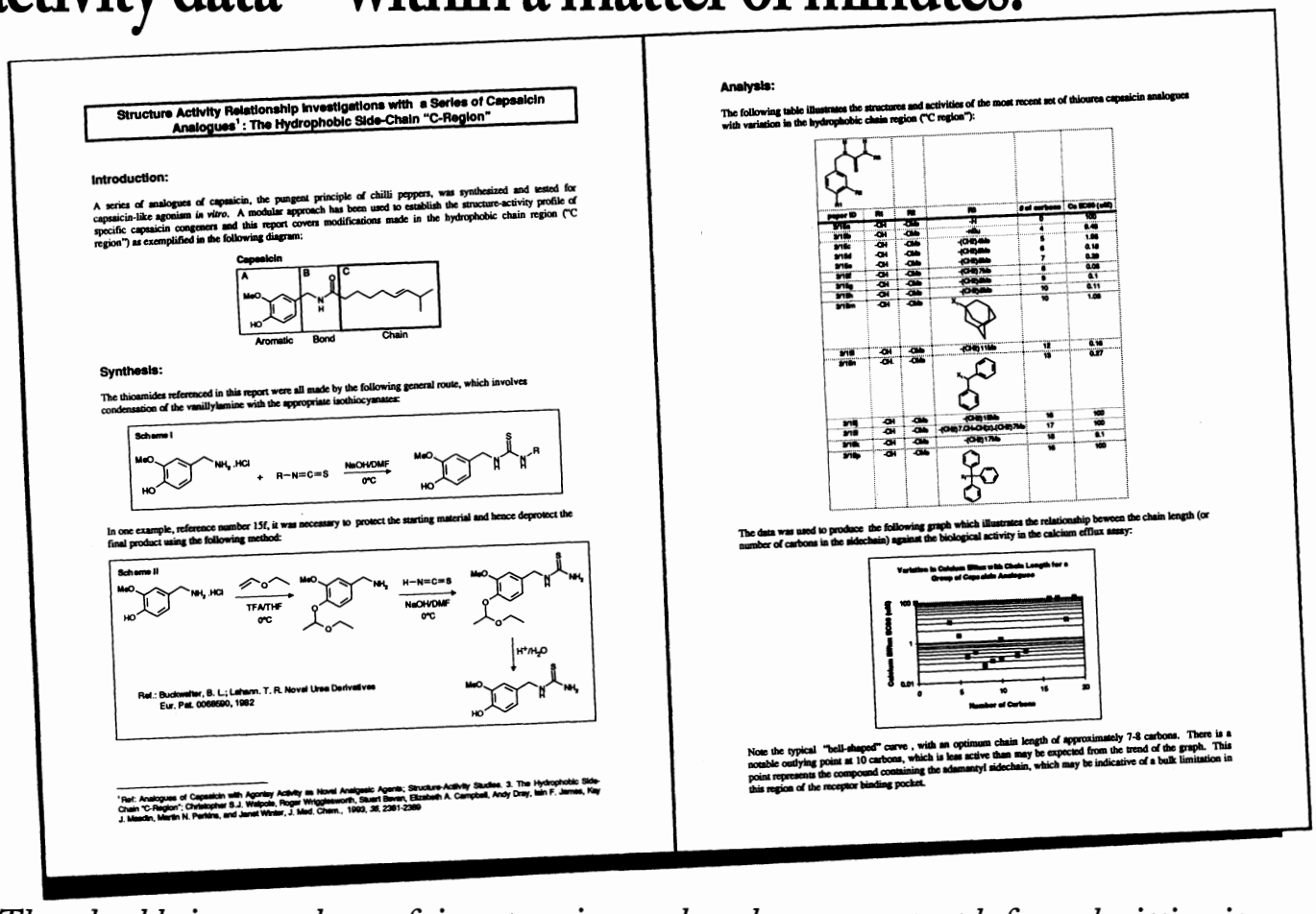
For Research Use Only. Not for use in diagnostic procedures. ApopTag™ is a trademark of Oncor, Inc.

1 Yonehara, S., *et al*, (1989) *J. Exp. Med.* 169:1747-1756.

2 JFR Kerr, J Searle, BV Harmon & CJ Bishop, in: Potten, CS (ed) (1987) *Perspectives in mammalian cell death.* Oxford U. Press, pp. 93-128. Z Zakeri, D Quaglino, T Latham & R Lockshin, (1993) *FASEB Journal;* 7:470-478; and manuscripts submitted.

3 X Li, W James, F Traganos & Z Darzynkiewicz, (1993) manuscript submitted.

MDL's new ISIS SAR Table lets you view, correlate, graph, and report chemical structures and their activity data—within a matter of minutes!



Structure Activity Relationship Investigations with a Series of Capsaicin Analogues[1]: The Hydrophobic Side-Chain "C-Region"

Introduction:

A series of analogues of capsaicin, the pungent principle of chilli peppers, was synthesized and tested for capsaicin-like agonism *in vitro*. A modular approach has been used to establish the structure-activity profile of specific capsaicin congeners and this report covers modifications made in the hydrophobic chain region ("C region") as exemplified in the following diagram:

Capsaicin

A B C

Aromatic Bond Chain

Synthesis:

The thioamides referenced in this report were all made by the following general route, which involves condensation of the vanillylamine with the appropriate isothiocyanates:

Scheme I

NH_2.HCl + R–N=C=S → NaOH/DMF, 0°C

In one example, reference number 15f, it was necessary to protect the starting material and hence deprotect the final product using the following method:

Scheme II

TFA/THF, 0°C → NaOH/DMF, 0°C → H^+/H_2O

Ref.: Buckwalter, B. L.; Lehann. T. R. Novel Urea Derivatives Eur. Pat. 0068590, 1982

[1] Ref: Analogues of Capsaicin with Agonist Activity as Novel Analgesic Agents; Structure-Activity Studies. 3. The Hydrophobic Side-Chain "C-Region". Christopher S.J. Walpole, Roger Wrigglesworth, Stuart Bevan, Elizabeth A. Campbell, Andy Dray, Iain F. James, Kay J. Masdin, Martin N. Perkins, and Janet Winter, J. Med. Chem., 1993, 36, 2381-2389

Analysis:

The following table illustrates the structures and activities of the most recent set of thiourea capsaicin analogues with variation in the hydrophobic chain region ("C region"):

The data was used to produce the following graph which illustrates the relationship beween the chain length (or number of carbons in the sidechain) against the biological activity in the calcium efflux assay:

Variation in Calcium Efflux with Chain Length for a Group of Capsaicin Analogues

Calcium Efflux EC50 (nM)

Number of Carbons

Note the typical "bell-shaped" curve , with an optimum chain length of approximately 7-8 carbons. There is a notable outlying point at 10 carbons, which is less active than may be expected from the trend of the graph. This point represents the compound containing the adamantyl sidechain, which may be indicative of a bulk limitation in this region of the receptor binding pocket.

That should give you plenty of time to review and analyze your report before submitting it. It should also leave you with a great deal more time to devote to the creative aspects of the discovery and development process.

Structure-activity relationship tables are such a key step in identifying and refining promising compounds, yet the process of creating them has always been time-consuming and labor-intensive. But now the ISIS SAR Table application from MDL Information Systems, Inc., actually reduces SAR Table creation to a simple two-step process carried out on your desktop computer running Macintosh or Windows.

A part of MDL's ISIS family of chemical information management solutions, ISIS SAR Table combines the best features of two top-notch applications—the information integration expertise of ISIS/Base and the spreadsheet expertise of Microsoft Excel—to bring you a spreadsheet especially suited for scientists.

Just how good is the ISIS SAR Table? According to Dr. Kevin Haraki of American Cyanamid Company:

"ISIS SAR Table is the first application that really combines structures and data in a single spreadsheet that can be manipulated. It is an elegant method for organizing structures and related data that allows researchers to visually examine related structures and data in close proximity, helping the researcher to discover trends in the data."

To discuss your requirements, or to place your order, call or FAX today. Tel: (800) 635-0064 • FAX: (510) 483-4738

MDL
Information Systems, Inc.
14600 Catalina Street • San Leandro • California 94577

Embryotech Laboratories, Inc.

313 Speen Street · Natick, MA 01760 · (508) 655-8080

- **Cryopreserved Mouse Embryos**

  Transgenics: Pronuclear stage and ES cell chimera recipients
  Research & Toxicology: 1-cell, 2-cell and 8-cell stages

- **In Vitro Toxicity Testing**

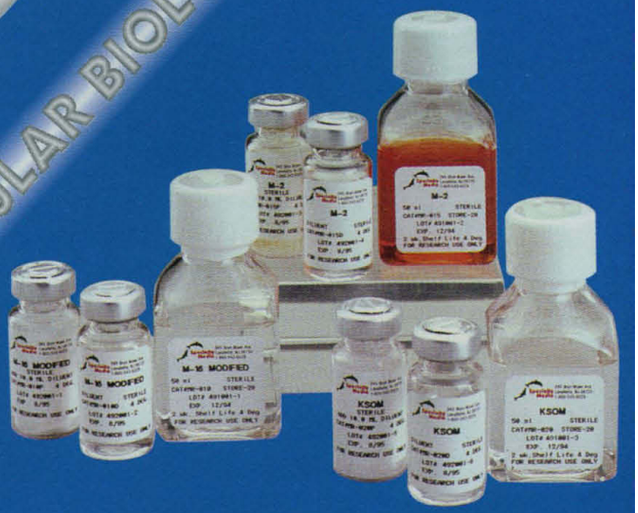
  Media, serum and disposables
  · Embryo Development · Endotoxin
  · Cytotoxicity · Sperm Motility

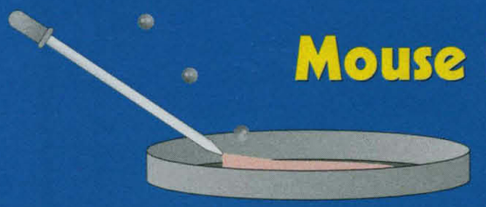
- **Novel Cell Lines**

  Immortalized
  Transgenic
  Primary Embryonic

- **Embryo-Tested Culture Media**
- **Rodent Biospecimens**
- **Micromanipulation Pipets**

CELL CULTURE • TRANSGENICS • MOLECULAR BIOLOGY • EMBRYOLOGY





Mouse Embryo Culture Media

M-2, M-16, KSOM, CZB, Whitten's, BMOC-3, BWW, Acidic Tyrode Solution

Embryonic Stem Cell Media, Serum, and Reagents

ES Cell DMEM
ES Cell Qualified FBS
0.1% Gelatin in Water
ES Cell Cryopreservation Medium

Specialty Media, inc.

406 Grand Central Avenue · Lavallette, NJ 08735 · 800-543-6029

Circle No. 53 on Readers' Service Card

PIERCE SIGNAL TRANSDUCTION

Sensitive, colorimetric kinase assays that let YOU choose your substrate . . . Science Fiction?

Science Fact!

Introducing Pierce Colorimetric Protein Kinase Assay Kits—the only safe, sensitive, fast and easy alternatives to radioactive kinase assays. Choose from complete, easy-to-use colorimetric kits for Protein Kinase C, Protein Kinase A and Protein Tyrosine Kinase.

Pierce colorimetric assay kits give you all the sensitivity you need and great flexibility in substrate use, while avoiding the hassles and hazards of working with radioactivity. And the kits are so fast and easy to use, you can process 48 samples in under 2 hours!

Get the facts. Call today for your free 20-page technical brochure on Pierce's comprehensive line of colorimetric protein kinase assay kits and accessory products. 1.800.8.PIERCE

ISO 9001 QUALITY SYSTEM CERTIFIED

To order in the U.S.A.: Pierce • 3747 N. Meridian Rd. • P.O.Box 117 • Rockford, IL 61105 • **Telephone: 800.874.3723 FAX: 800.842.5007** • Internet E-mail Address: PierceChem@mcimail.com
European Office: Pierce Europe B.V. • P.O. Box 1512 • 3260 BA Oud Beijerland • The Netherlands • Telephone: 31.1860.19277 FAX: 31.1860.19179

European Distributors:

Austria	018891819	Denmark	44948822	Italy	025097220	Norway	22722100
Belgium	036465511	France	070038855	Holland	0206113133 or 076795795	Spain	017290333
		Germany	0224196850			Switzerland	0217287772
						United Kingdom	0244382525
						Sweden	087460035

Outside Europe and the U.S., contact Pierce U.S. for your local Pierce distributor. Telephone: 815.968.0747 FAX: 815.968.8148

PIERCE
a Perstorp Biotec Company

Circle No. 52 on Readers' Service Card